

FIGURE 1





Mouse FGF-23

| 10 2 20 30 40 | 50 60 |
|--|--------------------------|
| ATGCTAGGGACCTGCCTTAGACTCCTGGTGGGCGTGCTCTGCACTGT | CTGCAGCTIGGGC |
| M L G T C L R L L V G V L C T V | () (0 |
| 70 80 90 100 | 110 120 |
| _ACTGCTAGAGCCTATCCAGACACTTCCCCATTGCTTGGCTCCAACLG | GGGAAGCCTGACC |
| TARAYPOTSPLLGSNW | GSCI |
| 130 140 150 160 | 170 180 |
| CACCTGTACACGGCTACAGCCAGGACCAGCTATCACCTACAGATCCA | TAGGGATGGTCAL |
| H L Y T A T A R T S Y H L Q I H | R D G H |
| | 230 240 |
| 190 200 210 220 GTAGATGGCACCCCCATCAGACCATCTACAGTGCCCTGATGATTAC | |
| V D G T P 并Q T I Y S A L H I T | SEDA |
| | |
| 250 260 270 280 | 290 300 |
| GGCTCTGTGGTGATAACAGGAGCCATGACTCGAAGGTTCCTTTGTAT | D I H G |
| G S V V I T G A M T R R F L C M | 0 2 11 0 |
| | 350 360 |
| - AACATTTTTGGATCGCTTCACTTCAGCCCAGAGAATTGCAAGIICCG | CCAGTGGACGCTG |
| NIFGSLHFSPENCKFR | Q m I L |
| 370 380 390 400 | 410 420 |
| - CACAATCCCTATCACCTCTACTTCTCCCAGAAGCATCACTACCTGGI | GAGCCTGGGCCGC |
| ENGYDVYLSQKHHYLV | SLGR |
| 그 그 그 그 살아 보다 되었다면 하다 하는 것 같아 하는 것 같아. | |
| CCCAACCCCATTTTCCACCCCCCCCACCAACCCGCCCCCCTTCTCCCAC | STICCIOGCICGC |
| A KOR I TELEVEP GOT N P P P F S Q | FLAR |
| | |
| | 530 540 CCACACGCGCAGC |
| AGGAACGAGGTCCCGCTGCTGCACTTCTACACTGTTCGCCCACGGCGC | H T R S |
| K W E V IV L 'L N F I I I V W I W W | |
| | 590 600 |
| GCCGAGGACCCAGCCGAGCGCGACCCACTGAACGTGCTCAAGCCGCGC | CCCCGCGCCACG |
| A E D P P E R D P L N V L K P R | PKKI |
| | 550 660 |
| ~~CCTGTGCCTGTATCCTGCTCTCGCGAGCTGCCGAGCGCAGGGAAGGI | ragececaces |
| PVPVSCSRELPSAEEG | GPAA |
| 700 | 710 720 |
| 690 700 AGCGATCCTCTGGGGGTGCTGCGCAGAGGCCGTGGAGATGCTCGCGGG | |
| S DIP LINGS WERE TRUE R G R G D A R G | G A G G |
| | |
| 730 740 750 760 | |
| GCGGATAGGTGTCGCCCCTTTCCCAGGTTCGTCTAG A DER COROPER POR F V * | |
| A DER COR PREFERENCE | • |
| | |

. .

| Huma | n | FG | F - , | 23 | | | | | | | | | | | | | | | | | |
|------|-----|------------|------------|----------|---------------|-------|------------|--------------|-------|------|-----|------|------|------|------|------|-------|------|--------------|------|-------|
| | | : | | 10 | | | ٠. | 20 | | | | 30 | | | 40 | | | 5(| a | | 60 |
| at | a t | ť tad | | 10 20 | cco | ac | ct | 20 caa | ac | tct | aaa | tct | tata | ıcct | tqt | gca | gcg | tct | gca | gcat | tgagc |
| | | (| | Ã | R | | L | R | Ĺ | W | ٧ | | Ā | L | . (| Š | V | C. | S | Н | S |
| | | - | | 70 | | | | 80 | | | | 90 | | | 100 | | | 116 | 3 | | 120 |
| gt | cc | tco | | | | | | | | cct | | | tgc | tcg | | | gct | | | gcct | gatc |
| V | L | F | ţ. | Ā | 4. Y . | . : | Ρ. | ,N | Ā | S | Ρ | ι | | Ğ | S | S | W | G | G | L | I |
| | | • | 1 = | 30 | | | ٠,٠ | 140 | ٠ | | 1 | 50 | | | 160 | | | 176 | , | | 189 |
| ca | c c | tgt | a (| | :ag | . c | αc | aac | cas | gga | aca | gct | acc | acc | tgc | agat | tcc | acac | iga | otgg | ccat |
| Н | L | 1 | • | T | Δ | | Ţ. | Έ Α . | R | N | S | Y | H | L | Q | Ι | Н | K | N | G | Н |
| | | | 1.0 | 18 | | | | 200 | | | 2 | 10 | | | 220 | | | 230 |) | | 240 |
| ato | aa | ato | ac | ac | ac | c c | ca | tca | gae | cat | | | gtg | | | | cag | | | agga | tgct |
| ٧ | D | Ğ | | Ă | . P. | . 1 | Н. | Q | T | I | Υ | 5 | A | L | м | I | R | S | Ε | D | A |
| | | | 25 | 0 | | | | 260 | | ٠ | | 70 | | | 280 | | | 290 | | , | 300 |
| | tt | ttg | tg | gt | gat | tţ | acı | 199 | tgt | gat | :ga | gca | gaa | gati | occ. | tctg | cat | 990 | ttt | cag | aggc |
| G | F | . V | | V | . 1 | | ∤ . ∶ : | G | ٧ | М | 2 | K | ĸ | ı | L | C | М | U | r | ĸ | G |
| | | | 31 | ø. | : | ٠. | | 320 | | | | 30 | | | 340 | | | 350 | | | 360 |
| | at | tt | tt | 99 | ato | a | cui | ta: | ttt | cgc | 100 | cgg | aga | act | gcag | ggtt | C C 0 | iaca | CCC | igac | gctg |
| N | Ι. | F | ٠ | G | Ş | Ţ | d | .Y | F | D | ρ | t | N | C | K | F | Ų | н | Q | • | L |
| | | : | 37 | 0 | • | | | 880 | | | 39 | 90 | | | 100 | | | 410 | | | 420 |
| gad | ac | ca | aa | ťα | c gʻo | ı ⊂ (| o t c | tac | cca | icto | tc | ctc | agt | atco | acti | cct | ggt | cag | tçt | 999 | ccgg |
| Ε | N | : G | | Y | D |) | / | Υ | Η. | S | Р | Q | Υ | Н | ŀ | Ŀ | V | 2 | L | G | R |
| | | | 4 3 | 0: | • | | ž | 40 | | | 45 | 50 | | 4 | 160 | | | 470 | | | 480 |
| gcg | ac | iga | gu | ġc | ctt | c | ti | je e d | agg | cat | gad | ic c | caco | | gta | ictc | cca | gtt | cct | gtc | ccgg |
| A | K | R | | Α. | F | ı | : | Ρ. | G | H | И | P | P | P | ĭ | S | Ų | r | L. | 5 | R |
| | | | 4 9 | 0 | | * | . 5 | 00 | ٠. | | 51 | 1.0 | | | 520 | | | 530 | | | 540 |
| agg | ac | èg | ۾ ه | аŧ | ccc | c (| to | ratt | . c a | ctt | cac | ca | ccc | cat | acc | acg | gcg | gca | cac | ccg | gagc |
| R | N | E | | Ι | Ρ | Ł | | I | Н | F | N | T | Р | I | - P | R | R | H | - 1 | R | 5 |
| | | : | 55 | 0 | 2.0 | ٠., | ···. 5 | 60 | | | 57 | '0 | | | 88 | | | 590 | | | 600 |
| gcc | go | ووا | o c | gā | ctc | gg | jag | cgç | jga | ccc | cct | gad | ocgt | gct | gad | gcc | ccg | 99C | c c g | gate | gacc |
| A | E | Đ | • • | D, | `.S, | £ | | R | D. | P | L | H | ٧ | L | K | P | R | A | К | Н | ı |
| | | ; | 61. | მ | : : | | Ē | 2.0 | | | 63 | 0 | | 6 | 40 | | | 650 | | | 660 |
| ccg | ac | cc. | כס: | àċ | ctc | ct | at | tco | ıca | aga | act | CCC | gag | lcgc | cga | gga | caa | cag | C C C | gatç | 19cc |
| P | A | įΡ | | Ā | ` S | C | | S | Q | E | ι | Р | S | A | Ε | D | N | 5 | Р | H | A |
| | | : . 1 | 67 | ຄ. | | | . 6 | 80 | | | 69 | 13 | | 7 | 00 | | | 710 | | | 720 |
| agt | aa | CC. | ca: | ťť | aao | ac | it a | ato | Ͻ: | aaa | caa | tcg | gagt | gaa | cac | gca | cgc | tigg | 399 | aacg | jąg c |
| S | D | P | | l. | G | ٧ | | .y . | R |).G | G | R | ٧ | И | T | H | A | G | ſ | 1 | U |
| | : | | 731 | Э | · | (| 7 | 40 | | | 75 | 0 | | 7 | 60 | | | | | | |
| ccg | go | ķg | g c | tġ | وضع | cc | ćc | tto | gc | caa | gtt | cat | cta | g | | | | | | | |
| Р | E | <u>.</u> G | • | C. | R. | P | | F. | ¥. | K | F | I | = | | | | | | | | |

| Mouse FGF-23 | MLGTCLRLLVGVLCTVCSLGTARAYPOTSPLLGSNWGSLTHLYTATARTSYHLQIHRDGH | 6 |
|--------------|---|-----|
| Human FGF-23 | MLGARLRLWVCALCSVCSMSVLRAYPNASPLLGSSWGGLIHLYTATARNSYHLQIHKNGH | 6 |
| | VDGTPHQTIYSALMITSEDAGSVVITGAMTRRFLCMDLHGNIFGSLHFSPENCKFRQWTL | 120 |
| | VDGAPHQTIYSALHIRSEDAGFVVITGVMSRRYLCMDFRGNIFGSHYFDPENCRFQHQTL | 120 |
| | ENGYDVYLSQKHHYLVSLGRAKRIFQPGTNPPPFSQFLARRNEVPLLHFYTVRPRRHTRS | 180 |
| | ENGYDVYHSPQYHFLVSLGRAKRAFLPGMNPPPYSQFLSRRHEIPLIHFNTPIPRRHTRS | 180 |
| | AEDPPERUPLNYLKPRPRATPVPVSCSRELPSAEEGGPAASDPLGVLRRGRGDARGGAGG | 240 |
| | AEDDSERDPLNVLKPRARMTPAPASCSQELPSAEDNSPMASDPLGVVRGGRVNTHAGGTG | 248 |
| | ADRCRPFPRFV 251 | |
| | PEGCRPFAKFI 251 | |

| 53 | HLGARLRLWYCALCSVCSMSVLRAYPNASPLLGSSWGGLIHLYTATARNSYHL | Human FGF-23 |
|-----|--|--------------|
| 60 | MRSGCVVVIIVWILAGLWLAVAGRPLAFSDAGPHVHYGWGDPIRLRHLYTSGPHGLSSCFL | Human FGF-19 |
| 113 | QIHKNGHVDGAPHQTIYSALMIRSEDAGFVVITGVMSRRYLCMDFRGNIFGSHYFDPENC | |
| 120 | DTD ADCIDIOC ADCIDCALICALICALICALISMA DTV 4 TV CORRIGINAL CALCALISMA CALCALIS | |
| 172 | RFQHQTLENGYDVYHSPQYHFLVSLGRAK-RAFLPGHNPPPYSQFLSRRNEIPLIHFNTP * **.**.********* | |
| 180 | AFEEEIRPDGYNYYRSEKHRLPVSLSSAKQRQLYKNRGFLPLSHFLPMLPMVPEEPEDLR | |
| 232 | IPRRHTRSAEDDSERDPLNVLKPRARMTPAPASCSQELPSAEDNSPHASDPLGVVRGGRV | |
| 216 | GHLESDMFSSPLETDSMDPFGLVTGLEAVRSPSFEK | |
| 251 | NTHAGGTGPEGCRPFAKFI | |

| | • | |
|--------------|--|-----|
| Human FGF-23 | MLGARLRLWVCALCS-VCSMSVLRAYPNASPLLG-SSWGGLIHLYTATARNS-YH | 52 |
| Human FGF-21 | MOSDETGFEHSGLWVSVLAGLLLGACQAHPIPDSSPLLQFGGQVRQRYLYTDDAQQTEAH | 60 |
| | LQIHKNGHVDGAPHQTIYSALMIRSEDAGFVVITGVMSRRYLCMDFRGNIFGSHYFDPEN | 112 |
| | LEIREDGTVGGAADQSPESLLQLKALKPGVIQILGVKTSRFLCQRPDGALYGSLHFDPEA | 120 |
| | CRFQHQTLENGYDVYHSPQYHFLVSLGRAKRAFLPGMNPPPYSQFLSRRNEIPLIHFNTP | 172 |
| | CSFRELLLEDGYNVYQSEAHGLPLHLPGNKSP-HRDPAPRGPARFLPLPGLPPALPEP | 177 |
| | IPRRHTRSAEDDSERDPLNVLKPRARMTPAPASCSQELPSAEDNSPMASDPLGVVRGGRV | 232 |
| | -PGILAPQPPDVGSSDPLSMVGPSQGRSPSYAS | 209 |
| | NTHAGGTGPEGCRPFAKFI | 251 |

 $\begin{tabular}{ll} \hline Figure 7 \\ \hline \end{tabular}$ Codon usage for yeast (highly expressed) genes

| | AmAcid | Codoñ | Number | /1000 | Fraction | |
|--|--------|-------|---------|---------|----------|--|
| | Gly | GGG | 33.00 | 0.86 | 0.01 | |
| | Gly | GGA | 70.00 | 1.82 | 0.02 | |
| | Gly | GGT | 2672.00 | 69.62 | 0.91 | |
| | Gly | GGC | 171.00 | 4.46 | 0.06 | |
| | Glu | GAG | 277.00 | 7 22 | 0.10 | |
| | Glu | GAA | 2442.00 | 63.63 | 0.90 | |
| | Asp | GAT | 1100.00 | 28.66 | 0.48 | |
| | Asp | GAC | 1211.00 | 31.55 | 0.52 | |
| | Val | GTG | 117.00 | 3.05 | 0.04 | |
| e mail | Val | GTA | 75.00 | 1.95 | 0.03 | |
| observation of the control of the co | Val | GTT | 1548.00 | 40.33 | 0.56 | |
| | Va 1 | GTC | 1026 00 | 26.73 | 0.37 | |
| | Ala | GCG | 36.00 | 0.94 | 0.01 | |
| Control of the contro | Ala | GCA | 203.00 | 5.29 | 0.06 | |
| | Ala | GCT | 2221.00 | 57.87 | 0.65 | |
| | Ala | GCC | 969.00 | 25.25 | 0.28 | |
| | Ang | AGG | 20 00 | 0.52 | 0.01 | |
| t and | Arg | AGA | 1336.00 | 34.81 | 0.83 | |
| L COMPANY | Sen | AGT | 116.00 | 3.02 | 0.05 | |
| | Ser | AGC | 94.00 | 2.45 | 0.04 | |
| | Lys | AAG | 2365.00 | 61.62 | 0.78 | |
| | Lys | AAA | 651.00 | 16.96 | 0.22 | |
| | Asn | AAT | 347 00 | 9.04 | 0.22 | |
| | Asn | NAC | 1259.00 | 32.80 | 0.78 | |
| | Met | ATG | 766.00 | 19.96 | 1.00 | |
| - | He | ATA | 43.00 | 1.12 | 0.02 | |
| | He | ATT | 1223.00 | 31.87 | 0.52 | |
| | He | ATC | 1070.00 | 27 . 88 | 0.46 | |
| | Thr | ACG | 28.00 | 0.73 | 0.01 | |
| | Thr | ACA | 126.00 | 3.28 | 0.06 | |

Figure 7 (continuea)

| | Thr | ACT | 1129.00 | 29.42 | 0.50 |
|--|---------|---------|---------|-------|------|
| | Thr | ACC | 962.00 | 25.07 | 0.43 |
| | | | | | |
| | Trp | TGG | 325.00 | 8.47 | 1.00 |
| | End | TGA | 10.00 | 0.26 | 0.09 |
| | Cys | TGT | 254.00 | 6.62 | 0.89 |
| | Cys | TGC | 33.00 | 0.86 | 0.11 |
| | | | | | |
| | — End — | TAG. | 11.00 | 0.29 | 0.10 |
| | End | TAA | 85.00 | 2.21 | 0.80 |
| | Tyr | TAT | 219.00 | 5.71 | 0.19 |
| | Tyr | 1AC | 913.00 | 23.79 | 0.81 |
| | Leu | ΠĜ | 2202.00 | 57.38 | 0.69 |
| | Leu | ΤΤĀ | 576.00 | 15.01 | 0.18 |
| | Phe | TTT | 432.00 | 11.26 | 0.27 |
| | Phe | TTC | 1145.00 | 29.83 | 0.73 |
| | 7.172 | , , , | 1 | | |
| y mag design | Ser | TCG | 26.00 | 0.68 | 0.01 |
| | Sen | TCA | 149.00 | 3.88 | 0.06 |
| To the second se | Ser | TCT | 1279.00 | 33.33 | 0.52 |
| | Ser | TCC | 818.00 | 21.31 | 0.33 |
| 2 | | | | | |
| J. states. | Ang | CGG | 0.00 | 0.00 | 0.00 |
| | Arg | CGA | 1.00 | 0.03 | 0.00 |
| i i i i i i i i i i i i i i i i i i i | Ang | CGT | 249.00 | 6.49 | 0.15 |
| and and a second a | Arg | CGC | 5.00 | 0.13 | 0 00 |
| of the section of the | į. | | | | |
| 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | Gln | CAG | 62.00 | 1.62 | 0.05 |
| | Gln | CAA | 1225.00 | 31 92 | 0.95 |
| į. | His | CAT | 236.00 | 6.15 | 0.35 |
| | His | CAC | 433.00 | 11.28 | 0.65 |
| | Leu | CTG | 52.00 | 1.35 | 0.02 |
| | Leu | СТА | 236.00 | 6.15 | 0.07 |
| | Leu | CIT | 90.00 | 2.35 | 0.03 |
| | Leu | CTC | 14.00 | 0.36 | 0.00 |
| | LVU | () I () | 11.00 | 0.00 | |
| | Pro | CCG | 10.00 | 0.26 | 0.01 |
| | Pro | CCA | 1271.00 | 33.12 | 0.80 |
| | Pro | CCT | 279.00 | 7.27 | 0.18 |
| | Pro | CCC | 33.00 | 0.86 | 0.02 |

 $Figure \ 8$ Codon usage for Drosophila (highly expressed) genes

| | AmAcid | Codon | Number | /1000 | fraction | |
|--|------------|-------|-----------------------|---------|----------|--|
| | Gly | GGG | 6.00 | 0.28 | 0.00 | |
| | Glv | GGA | 380,00 | 18.04 | 0.22 | |
| | Gly | GGT | 575.00 | 27 . 29 | 0.34 | |
| | Gly | GGC | 746.00 | 35.41 | 0.44 | |
| | Glu | GAG | 1217.00 | 57.77 | 0.91 | |
| | Glu | GAA | 115.00 | 5.46 | 0.09 | |
| | Asp | GAT | 503.00 | 23.88 | 0.43 | |
| | Asp | GAC | 654.00 | 31.04 | 0.57 | |
| | Val | GTG | 719.00 | 34.13 | 0.45 | |
| String. | Val | GTA | 29.00 | 1.38 | 0.02 | |
| TO STATE OF THE PARTY OF THE PA | Val | GTT | 226.00 | 10.73 | 0.14 | |
| | Val | GTC | 608 00 | 28.86 | 0.38 | |
| | Ala | GCG | 94.00 | 4.46 | 0.05 | |
| The state of the s | Ala | GCA | 80.00 | 3.80 | 0.04 | |
| 1 | Ala | GCT | 446.00 | 21.17 | 0.24 | |
| : | Ala | GCC | 1277.00 | 60.61 | 0.67 | |
| | Ang | AGG | 48.00 | 2.28 | 0.06 | |
| | Arg | AGA | 12.00 | 0.57 | 0.01 | |
| | Ser | AGT | 16.00 | 0.76 | 0.01 | |
| juž. | Ser | AGC | 267.00 | 12.67 | 0.23 | |
| | Lys | AAG | 1360.00 | 64.55 | 0.93 | |
| | Lys | AAA | 108.00 | 5.13 | 0.07 | |
| | Asn | AAT | 127.00 | 6.03 | 0.13 | |
| | Asn | AAC | 878.00 | 41.67 | 0.87 | |
| | Met | ATG | 387.00 | 18.37 | 1.00 | |
| | He | ATA | 4.00 | 0.19 | 0.00 | |
| | He | ATT | 390.00 | 18.51 | 0.29 | |
| | lle | ATC | 969.00 | 45.99 | 0.71 | |
| | The | ACG | 114.00 | 5.41 | 0.08 | |
| | Thr Thr | ACA | 34.00 | 1.61 | 0.02 | |
| | 1111 | ハイ・ | ψ ¹ 1. U U | 1.01 | | |

Figure 8 (continued)

| | Thr | ACT | 164.00 | 7.78 | 0.11 |
|-----------------------|----------|-------|---------|-------|------|
| | Thr | ACC | 1127.00 | 53.49 | 0.78 |
| | | | | | |
| | Trp | TGG | 243 00 | 11.53 | 1.00 |
| | £nd | TGA | 1.00 | 0.05 | 0.01 |
| | Cys | TGT | 20.00 | 0.95 | 0.08 |
| | Cys | TGC | 220.00 | 10.44 | 0.92 |
| | 5,7 5 | | | | |
| | End | TAG | 12 00 | 0.57 | 0.17 |
| | End | TAA | 58.00 | 2.75 | 0.82 |
| | Tyr | TAT | 113.00 | 5.36 | 0.16 |
| | Tyr | TAC | 574.00 | 27.25 | 0.84 |
| | . | | | | |
| | Leu | 116 | 210.00 | 9.97 | 0.12 |
| | l.eu | TTA | 9.00 | 0.43 | 0.01 |
| | Phe | TTT | 62.00 | 2.94 | 0.09 |
| | Phe | TTC | 635.00 | 30.14 | 0.91 |
| | | | | | |
| C Million | Ser | TCG | 195.00 | 9.26 | 0.17 |
| | Ser | TCA | 29.00 | 1.38 | 0.02 |
| | Ser | TCT | 103.00 | 4.89 | 0.09 |
| Sand Sanda | Ser | TCC | 558.00 | 26.49 | 0.48 |
| apple | | | | | |
| | Ang | CGG | 7.00 | 0.33 | 0.01 |
| | Arg | CGA | 25.00 | 1.19 | 0.03 |
| e : e : d annum | Arg | CGT | 281.00 | 13.34 | 0.34 |
| ii | Ang | CGC | 465.00 | 22.07 | 0.55 |
| | 70 9 | O/C/C | 100.00 | •••• | |
| | Gln | CAG | 703.00 | 33.37 | 0.91 |
| | Gln | CAA | 66.00 | 3.13 | 0.09 |
| į | His | CAT | 88.00 | 4.18 | 0.22 |
| | His | CAC | 312.00 | 14.81 | 0.78 |
| | 1115 | 0/10/ | 012.00 | | |
| | Leu | CTG | 1182.00 | 56.10 | 0.69 |
| | Leu | СТА | 21.00 | 1.00 | 0.01 |
| | Leu | CTT | 55.00 | 2.61 | 0.03 |
| | Leu | CTC | 224.00 | 10.63 | 0.13 |
| | Leu | CIC | 224.00 | 10.00 | 0.10 |
| | Pro | CCG | 84.00 | 3.99 | 0.09 |
| | Pro | CCA | 135.00 | 6.41 | 0.15 |
| | Pro | CCT | 72.00 | 3.42 | 0.08 |
| | | | 626.00 | 29.71 | 0.68 |
| | Pro | CCC | 020.00 | 60.11 | 0.00 |

Figure 9 Codon usage for enteric bacterial (highly expressed) genes 7/19/83

| | AmAcid | Codon | Number | /1000 | Fraction |
|--|--------|--------------|--------------|--------|----------|
| | Gly | GGG | 13.00 | 1.89 | 0.02 |
| | Gly | GGA | 3.00 | 0.44 | 0.00 |
| | Gly | GGU | 365.00 | 52.99 | 0.59 |
| | Gly | GGC | 238.00 | 34.55 | 0.38 |
| | Glu | GAG | 108.00 | 15.68 | 0.22 |
| | Glu | GAA | 394.00 | 57.20 | 0.78 |
| | | GAU | 149.00 | 21.63 | 0.33 |
| | Asp | GAC | 298.00 | 43.26 | 0.67 |
| | Asp | UNC | 200.00 | +O. LO | 0.07 |
| | Vāl | GUG | 93.00 | 13.50 | 0.16 |
| : crai: | Val | GUA | 146.00 | 21.20 | 0.26 |
| - Contraction 1 Contraction 1 Contraction 1 Contraction 2 Contraction 2 Contraction 3 Contraction 4 Contraction 5 Cont | Val | GUU | 289.00 | 41.96 | 0.51 |
| 3 4 50 3 1 1 3 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 | Val | GUC | 38.00 | 5.52 | 0.07 |
| | | | | | |
|) | Ala | GCG | 161.00 | 23.37 | 0.26 |
| 1 de la 1 | Ala | GCA | 173.00 | 25.12 | 0.28 |
| 7.5° V | Ala | GCU | 212.00 | 30.78 | 0.35 |
| | Ala | GCC | 62.00 | 9.00 | 0.10 |
| | | A C C | 1 00 | 0.15 | 0.00 |
| | Arg | AGG | 1.00 | 0.13 | 0.00 |
| tuni Lagi | Arg | AGA | 0.00 9.00 | 1.31 | 0.03 |
| . 0.27 | Ser | AGU | | 10.31 | 0.20 |
| of the second se | Ser | AGC | 71.00 | 10.51 | 0.20 |
| | Lys | AAG | 111.00 | 16.11 | 0.26 |
| | Lys | AAA | 320.00 | 46.46 | 0.74 |
| | Asn | AAU | 19.00 | 2.76 | 0.06 |
| | Asn | AAC | 274.00 | 39.78 | 0.94 |
| | 7,511 | , , , , , | | | |
| | Met | AUG | 170.00 | 24.68 | 1.00 |
| | He | AUA | 1.00 | 0.15 | 0.00 |
| | He | AUU | 70.00 | 10.16 | 0.17 |
| | Пе | AUC | 345.00 | 50.09 | 0.83 |
| | Thr | ACG | 25.00 | 3.63 | 0.07 |
| | Thr | ACA | 14.00 | 2.03 | 0.04 |
| | Thr | ACU | 130.00 | 18.87 | 0.35 |
| | Thr | ACC | 206.00 | 29.91 | 0.55 |
| | 1111 | 1 DAS | 200.00 | | |

Figure 9 (continued)

| | AmAcid | Codon | Number | /1000 | Fraction |
|--|--------------------|------------|---------------|--------------|--------------|
| | Trp | UGG UGA | 55.00 0.00 | 7.98 0.00 | 1.00 0.00 |
| | End Cys | UGU | 22.00 | 3.19 | 0.49 |
| | Cys | UGC | 23.00 | 3.34 | 0.51 |
| | <i></i> , <i>.</i> | West | 20.00 | | |
| | End | UAG | 0.00 | 0.00 | 0.00 |
| | End | UAA | 0.00 | 0.00 | 000 |
| | Tyr | UAU | 51.00 | 7.40 | 0.25 |
| | Tyr | UAC | 157.00 | 22.79 | 0.75 |
| | Lou | UUG | 18.00 | 2.61 | 0.03 |
| | Leu | | 12.00 | 1.74 | 0.02 |
| | Leu | UUA UUU | 51.00 | 7.40 | 0.24 |
| | Phe Phe | UUC | 166.00 | 24.10 | 0.76 |
| | FILE | UUC | 100.00 | (1.10 | 0.70 |
| | Ser | UCG | 14.00 | 2.03 | 0.04 |
| | Ser | UCA | 7.00 | 1.02 | 0.02 |
| 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - | Ser | UCU | 120.00 | 17 42 | 0.34 |
| 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - | Ser | UCC | 131.00 | 19.02 | 0.37 |
| | | | | | 0.00 |
| Tabuli San B | Arg | CGG | 1.00 | 0.15 | 0.00 |
| on the state of th | Arg | CGA | 2.00 | 0.29 | 0.01 |
| | Arg | CGU | 290.00 | 42.10 | 0.74 |
| | Arg | CGC | 96 00 | 13.94 | 0.25 |
| | Ola. | CAG | 233.00 | 33.83 | 0.86 |
| | Gln Gln | CAG | 37.00 | 5.37 | 0.14 |
| | His | CAU | 18.00 | 2.61 | 0.17 |
| | | CAC | 85.00 | 12.34 | 0.83 |
| | His | CAC | 00.00 | 12.01 | 0.00 |
| | Leu | CUG | 480.00 | 69.69 | 0.83 |
| | Leu | CUA | 2.00 | 0.29 | 0.00 |
| | Leu | CUU | 25.00 | 3.63 | 0.04 |
| | Leu | CUC | 38.00 | 5.52 | 0.07 |
| | | | | | 0.77 |
| | Pro | CCG | 190.00 | 27.58 | 0.77 |
| | Pro | CCA | 36.00 | 5.23 | 0.15 |
| | Pro | CCU | 19.00 | 2.76 | 0.08 |
| | Pro | CCC | 1.00 | 0.15 | 0.00 |

Figure 10

Chromosomal localization of genes of the FGF family in human

| Sene | Localization | Gene | Localization |
|--------|--------------|-----------|--------------|
| FGF-1 | 5q31.3-q33.2 | FGF=12 | og29-qter |
| FGF-2 | 4926 | FGF-13 | Σ |
| GF-3 | 11913 | FGF-14 | 13 |
| *GF'=4 | 11913.3 | (FGF-15) | |
| GF = 5 | 4q21 | FGF-16 | - |
| GF-6 | 12p13 | FGF-17 | 8p21 |
| GF-7 | 15q13-q22 | FGF-18 | Ş |
| GF-8 | 10q25-q26 | FGF-19 | 11q13.1 |
| 'GF-9 | 13q11-q12 | FGF-20 | 5p21.3-p22 |
| GF-10 | Sp12-p13 | FGF-21 | 19q13.1-qter |
| GF-11 | 1.7 | FGF-22 | 19p13.3 |
| | | FGF-23 [] | 12p13 |

Human FGF-15 gene has not been identified. The localization of human FGF-16 gene has not been determined.

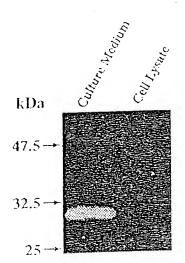




Figure 12

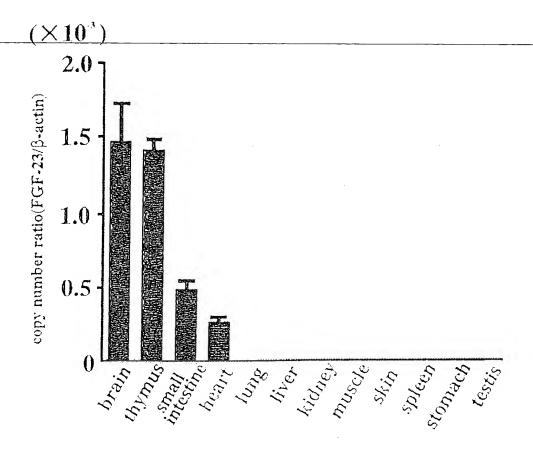


Figure 13

R

6XHis Tag

-20 kDa (not tagged) + -7-12 kDa (6xHis-tagged)

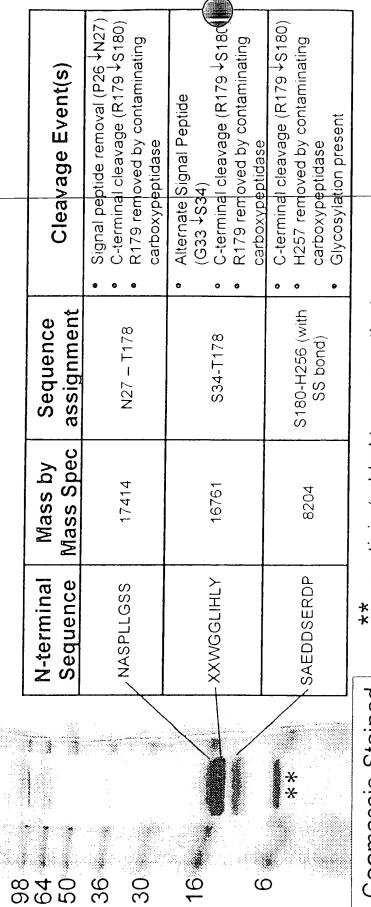
~28 KDa (6xHis-tagged)

| | | 11774 | 76 J | 9713 | 7520 KDa | | | | | | |
|--|--|--|-----------------------|-----------------------------|---|--|--|---|---|---|------------------|
| | (213) 213 | k pa | | KDa ₂₄₀ | 250 | 260 | 270 KU a 270 5260 | 250 | 000 | 310 | 323 |
| Ę, | 라(대) 전화 | RGF13 (141) ASGN ETTPGINGS PENSOTIS NO | T.SRENEIPLIHE | | TRSLEDDSER | PDPIINTKPRAF | TPIPRRHTRS.EDDSERDPINTKPRARMTPAPASCSQELPS.EDNSPMLSDPIGV/FGGRVNT | DIAGSTWAS MEET | 4.4 | AGGIGPEGORPFAKF | HKFI |
| | (121) 등 | hPGF1(121) NEFVG1/60/GSGFRGPRTHYGQFAITH | 2057年第一 | assmandalite | | | | | | 1 | ! ! ! |
| 当 | 10(175) 요축 | LICE-10(175) OLARVALNGKGAPERAGO - AKTRABONTSPHET | - AKTRAPOT | 돭 | | 1 | | 1 | 1 1 1 1 1 1 1 1 | | 1 1 |
| 5 1 | 11 (170) | HGE II (170) HWYLGLDGDOWRGON- | RWEGETKAJAH FI | K | O.W.R.A.B.II | -EPSINSVPERS | SKIGSSdSEEGVSHI | | 1 | t | 1 1 1 1 |
| 开 | 12(172) 꽃류 | F(F12(172) 安門G1条付合日表の上 | - TAWKGATIKPSISHFT | | 1 1 1 | -EPSIHEIGE | -EPSIHIIGIKQGR-SPKSSGTPTM9GGKVN1QDST | <u>ŦŢPŢMAIGGICANI IQ</u> E | GT | 1 1 1 1 1 1 1 1 1 1 | |
| E E | 구유 13 (168) 대전 | NDXIII 中国中国MD | HVACANKPASHE | . 1 | PKPTKVAMYK | -EPSIHDLTER | LHDLTEFS-F.SGSGTPTKSRSVSGVT.NGGKSNSH18T | /SGVIINGGKSNSH | EST | | 1 |
| 品品 | 1987年1987日 | HWFT GINKFEODAMKGN | TRYPORTED IN EL | | PKPPPVPMYR | -EPSIHDVGET | EPSIHDVGETVPKPGV-TPSKSTSASAIMAGGKPVNKSKTT | SENT PROGREDATED | +LLM | 1 f 1 f 1 t 1 t 2 t 2 t 3 | 1 1 1 |
| 货 | 15(17의 광료 | HGF15(175) 以明日日日春日日日日天日1 | | ר | AMR | -EPSTHDVGET | EPSIHDVGETVPKPGV~TPSXSTSASAIANGGKPVARSKTT+- | SELLING GOX PVPIESS | + | 1 | 1 1 1 |
| 是是 | FF16(180) dry | CYYVALAMASIPREGY | بہا_ | - | | TTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT | 1 | | 1 1 | 1 | 1 |
| 语言 | 10000000000000000000000000000000000000 | A PARCE CAN A SERVICE OF THE SERVICE | | | Ε, | | THE MADE TO A COMMENT OF THE PROPERTY OF THE P | DODI TITLI | 1 | 1 1 1 1 1 1 1 | |
| 世 年 | NETS(149) | | | | : | 100 - 11 - 10 - 10 - 10 - 10 - 10 - 10 | ONDERTAIN THE STREET STREET OF THE STREET ST | · · · · · · · · · · · · · · · · · · · | | 1 | 1 1 |
| H 44 | | | | | ! ! | | | | | | |
| 3 1 | | LEVS LOSAROTHOLY | 77.75 | FINAL LELISHE LEMINAV PEEF | 1 | - DERGREESDM | E-DLRGRIESDMEGSPLETDSMDFrolVGLEAVRSFSrea | LVICHERVEREN | 1 | ! ! ! ! ! ! | (- |
| 2 . | | TVATABINED VALGS | - TYPOPGOKALLE | ALIDELE SANSON | 1 1 1 1 1 1 1 1 1 1 1 1 | 1 | 1 | | 1 | 1 1 1 1 1 1 1 1 1 | 1 1 1 |
| き | | - PHINIPONKSPINDB | APRGP-MRE | -MREINLEGIPPALP | | -EPPGILAPOP | EFYSGILAPQPP-DVGSSDPLSWGPSQGRSPSYAS | PSQGRSPSYAS | 1 | | 1 1 1 |
| 된 | | WIVSVNGROPPROPT - KITRITOKSKIL | - ATTRIBLES | SSLETLPRATIOH | RDHENNROLO | -SGLPRPPGKG | LPRAÎDHROHEMMEQIQ-SGLPRPPGKGVQPRERRQKQSPOVLEFSHVQASRLGSQLEESH | LEFSHVQASPLOS(| | 1 | 1 1 1 |
| ソカ | 気一(ドンチウセ | HALTHER SON THE SON THE TOP TH | - JEVS PTRE | VIHELPRIO | 1 1 1 1 1 1 1 1 1 | 1 | 1111111111 | 1 | 1 | 1 | 1 1 1 1 |
| hPGFS pLTR122(187) 点 | 图(187)阳 | KINT TO THE CONTRACT OF THE STATE OF THE | SHARBOHI | STH FLPREKOSEOPE | 1 | -LSFTVTVPEK | LS FIVTVPPMGKPPS PIKPKIPLSAPRAJINSVRURLKFRFS | APPENITY SVACE L | (FR. 835) | 1 | 1 |
| FE FE | NATA (179) - TH | TYIAISKYGRVKAGBX | - HAVSPINIVIER | VITH ET PRU | - 1 | 1 1 1 1 1 | 1 | 1 | 1 1 1 1 1 1 | 1 | 1 1 1 |
| 굿 | ₹7 (162) FM | UPGE-7 (162) FIMEVAT NOKIGIT PVRGK- LYTIKKE OKMBH F | THE KAREOK | THAME, THEFT | 1 | \$ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 1 | 1 | 1 1 1 | 1 | 1 1 1 |
| PH PH | NGA-8(167) - NGA-1819 | TO A SET TRINGER PRINCES | GREENES - KIROHOREVHE | EVHEMEN PROHHTT | ! | d XNTE BERTS - | RESERVATION OF THE STREET OF T | | 1 | | i ! ! |
| 꾰 | hPGF-9(161) PAYYAFINA | YVAINACIONEREGE- | | RTKENOK FINE FILER BROWN P. | } } | -FINEDITSOS- | : | 1 1 1 1 1 1 1 1 1 1 | | 1 | 1 1 |
| S. S | 편0(16의 의전) | LEGISON SY TOTAL STORY | Ï | | PBV5 | -m/34/2/11/14/2/2/- | 1 | 1 | | 1 | 1 1 |
| というという | ± (139) udc | THURST TO THE TOTAL CONTROL OF THE PARTY OF | | | 1 | | 1 | 1 | 1 | 1 | 1 |
| المادات | Constraint (213) | | | | | | | | | | |
| } | | DATA D & HAVEN | 2772 | 45517K < | | | | | _ | | |

Fig. 15

Figure 16

6XHis-tagged hFGF-23 secreted by \$f9 cells Cleavage of baculovirus-expressed standards F.73 ards 250 kDa



Coomassie-Stained Gel

aprotinin (added to preparation)